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# The Double ABCX Model of Family Stress and Adaptation: An Empirical Test by Analysis of Structural Equations with Latent Variables

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*This study examines the relationships among the major variables of the Double ABCX model of family stress and adaptation. The theoretical model is translated into an empirically testable model using data on Army families' adaptation to the crisis of relocation overseas, and the data is analyzed by structural equation models with latent (unobserved) variables. The results support the notion of pile-up of demands, in that previous family life events significantly influence the postcrisis strain. Family system resources and social support are both found to facilitate adaptation, but in different ways: family system resources affect adaptation directly, whereas social support appears to have a buffering role in that it reduces the postcrisis strain. This study demonstrates the applicability of structural equation modeling approach (LISREL VI program) for theory building.*

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Efforts to understand and explain family response to stressful situations traditionally have been concentrated on the relations among three basic phenomena: the stressful event(s) and its associated hardships; the outcome of stress (crisis and adaptation); and the intervening factors between the two. The central question is, How much and what kinds of stressors, mediated by what family resources and processes, shape the course and ease of family adaptation?

Review of theory building and empirical studies in the 1970s (McCubbin et al., 1980) and the first half of the 1980s suggest that, parallel to the interest in theory building (e.g., Boss, 1980; Burr, 1973; Hansen and Johnson, 1979; McCubbin and Patterson, 1982, 1983a, 1983b), researchers have studied family processes, the mediating effects of various family resources, coping patterns and

perception, and adaptation to both normative transitions and nonnormative events.

In concluding their decade review of family stress and coping literature, McCubbin and associates (1980:866–867) suggest that, “as we increase the number of variables in the family stress equation, we need to develop research paradigms which include techniques such as path analysis, so we can begin to obtain a clearer picture of the ordering of these variables and, in turn, advance theory construction in this area of research.”

In response to this challenge, the present investigation was designed to examine the relations among some of the major variables of the Double ABCX model (McCubbin and Patterson, 1982, 1983a, 1983b) by using maximum likelihood analysis of structural equations with latent (unobserved) variables. This statistical approach, while highly compatible with the process of theory development and testing, has been used rarely in family studies. Therefore, we discuss some of its advantages and illustrate its applicability, after briefly presenting the theoretical model to be examined. The theoretical model then is translated into an empirically testable model, and the results are presented and discussed.

#### THE THEORETICAL MODEL

The Double ABCX model of family stress and adaptation (McCubbin and Patterson, 1982, 1983a, 1983b), shown in Figure 1, builds on Hill's (1949, 1958) ABCX model of family stress and crisis. It redefines precrisis variables and adds postcrisis variables in an effort to describe (a) the additional life stressors and strains, prior to or following the crisis-producing event, which result

in a pile-up of demands; (b) the range of outcome of family processes in response to this pile-up of stressors (maladaptation to bonadaptation); and (c) the intervening factors that shape the course of adaptation: family resources, coherence and meaning, and the related coping strategies.

#### *Pile-up (the aA Factor)*

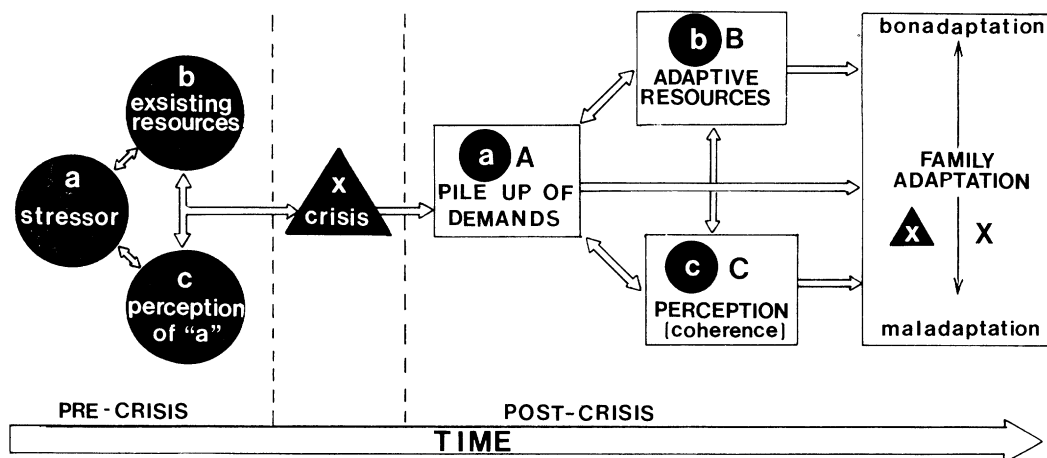
The pile-up of demands refers to the cumulative effect, over time, of pre- and postcrisis stressors and strains. Mechanic (1974) and Hansen and Johnson (1979) have suggested that stress be viewed as a process, a complex set of changing conditions that have a history and future, rather than a short-term, single stimulus. The clustering effect of normative and nonnormative events also has been noted by others (e.g., Hill and Joy, 1979; Mederer and Hill, 1983; Patterson and McCubbin, 1983). Additional stressors—such as required role changes, prior unresolved strains, intrafamily boundary ambiguity (Boss, 1977, 1980)—all may be demands for change and sources of strain that the family faces while struggling with the major stressor event.

#### *Family Adaptive Resources (the bB Factor)*

Adaptive resources refer both to existing resources and to expanded resources that are developed and strengthened in response to the demands posed by the stressor event. These resources mediate between the pile-up of demands and adaptation. As such, they can either reduce the impact of demands on the family and/or help the family adapt to the required changes.

Family adaptive resources may include (a) *per-*

FIGURE 1. THE DOUBLE ABCX MODEL (ADAPTED FROM McCUBBIN AND PATTERSON, 1983a)



*sonal resources*—i.e., characteristics of individual family members such as self-esteem, knowledge, and skills which are potentially available to the family in times of need (George, 1980; Pearlin and Schooler, 1978); (b) *family system resources*—i.e., internal attributes of the family unit such as cohesion, adaptability, and communication (Olson and McCubbin, 1982; Olson et al., 1983); and (c) *social support*—i.e., capabilities of people or institutions outside the family on which the family can draw or a network in which the family is cared for and loved, is esteemed and valued, and where it feels that it belongs (Cobb, 1976, 1979; Pilisuk and Parks, 1981, 1983).

#### *Perception and Coherence (the cC Factor)*

This factor refers to the family's general orientation to the overall circumstances. Antonovsky (1979) describes this orientation as the pervasive, enduring, though dynamic feeling of confidence that internal and external environments are predictable. It reflects a sense of acceptance and understanding of the situation, a framework within which definition of the situation is made and within which perceptions are judged. When applied to the family unit (McCubbin and Patterson, 1983a, 1983b), coherence is dynamically influenced by the experiences of the family—both its internal environment (such as perceived strengths) and the cumulative effect of experiences (positive and negative) with the external environment. In turn, it shapes the meaning the family gives to the total crisis situation, including the stressor event, added sources of strain (pile-up), and the resources the family has for meeting the demands. Coherence, then, is an intervening factor between crisis and adaptation and is another facilitator of the family's adaptive power.

#### *Family Adaptation (the xX Factor)*

Family adaptation is the outcome of the family's processes in response to the crisis and pile-up of demands. As Burr (1973) notes, adaptation does not mean that disorganization or change in the system have not occurred; it merely means that the system has resumed its routine level of operation after having to cope with change.

Family adaptation is a continuous variable, ranging from maladaptation to bonadaptation (McCubbin and Patterson, 1983a, 1983b). Maladaptation, the negative end of the continuum, is defined as continued imbalance between the pile-up of demands and the family's capabilities for meeting those demands. It may be characterized by deterioration of family integrity, of family members' sense of well-being, and of

their physical and/or psychological health. Bonadaptation, the positive end of the continuum, is defined as a minimal discrepancy between the pile-up of demands and the family's capabilities, so as to achieve a balance in family functioning. It is characterized both by maintenance or strengthening of family integrity and by family members' sense of well-being.

The following propositions are derived from the Double ABCX model of family adaptation to stressful situations: (a) the severity of strain associated with a crisis situation is influenced by other sources of demand (stressors and strains) on the family, and this is a positive relationship; (b) the level of adaptation of the family to the crisis situation is influenced by the severity of the pile-up of stressors and strains, and this is a negative relationship; (c) the amount of personal resources, family system resources, and social support the family has influences its adaptation to the pile-up of stressors and strains, and this is a positive relationship; (d) the amount of personal resources, family system resources, and social support influences the severity of strain created by the pile-up of demands, and this is a negative relationship; and (e) the level of the family's sense of coherence regarding the total situation (demands and capabilities) influences its adaptation, and this is a positive relationship.

In an attempt to examine these propositions, we examined the effect of various sources of demand on one another and on adaptation (propositions a and b), as well as the mediating effect of resources and sense of coherence (propositions c, d, and e). Of particular interest was the way by which these intervening factors mediate between stress and adaptation: Do they influence the family's adaptation *directly*, as in proposition c; or do they mainly serve their purpose indirectly, by buffering the stressor from creating stress, as in proposition d?

To achieve these goals, we examined the influence of two distinct sources of demand (aA factor), two characteristics of family resources (bB factor), and perception and coherence (cC factor) on each other and on adaptation (xX factor).

### EXPLORING CAUSAL RELATIONS AMONG STRESSORS, RESOURCES, PERCEPTION, AND ADAPTATION

#### *Causal Modeling*

In general, causal modeling attempts to provide an explanation of phenomena (effects) as a result of previous phenomena (causes). The notion of causality is controversial in social science

research, even more so within the framework of family systems thinking. Specifically, it has been suggested that unless variables are measured in some temporal order, an inference of causality cannot be validly made. In contrast, Bentler (1980: 420) has argued that "it is not necessary to take a stand on the meaning of 'cause' to see why the modeling process is colloquially called causal modeling (with latent variables). The word 'cause' is meant to provide no philosophical meaning beyond designation for a hypothesized unobserved process, so that phrases such as 'process' or 'system' modeling would be viable substitute labels for 'causal modeling.' "

Statistical approaches to analysis of causal models share several advantages: (a) they analyze simultaneous relations among the variables in the model; (b) they estimate the model's parameters so as to determine the significance of each hypothesized path and achieve an estimate of the relative strength of paths in relation to others; (c) they enable the investigator to differentiate between *direct* effect of independent on dependent variables and *indirect* effects of the former on the latter through some intervening variables. Furthermore, investigators can determine joint (spurious) effects due to relations with a common cause. In discussing the issue of fit between research methods and theories in family studies, Miller, Rollins and Thomas (1982:860) argued that "it is not enough to merely submit to empirical test a given number of bivariate relationships implied by the model. Multiple tests of bivariate relationships cannot adequately assess the 'nexus' of the multiple propositions nor the 'inferential form' implied by the theoretical model." It is for this reason that causal models' analysis techniques were found useful in studying more complex theoretical models, in which multiple variables are proposed to influence one another in some order.

Until recently, causal models were studied in the social and behavioral sciences most frequently by path analysis, a series of progressive multiple regression analyses. While having the advantages mentioned above, the validity of path analysis has been questioned lately (Schumm et al., 1980; Pedhazur, 1982). The main criticism has been that path analysis is based on a set of restrictive assumptions that rarely are met in social and behavioral studies, particularly in survey research. Specifically, the assumptions of measures without error and uncorrelated residuals are difficult to meet in a scientific field where many measures are not perfectly reliable and residuals are often correlated. In addition, many variables are unobserv-

able, complex constructs which are difficult to capture validly and reliably with single indicators.

### *Structural Equation Models*

Structural equation modeling, on the other hand, permits the analysis of causal relationships with latent (unobserved) variables, thus enabling theory testing. It is primarily for this reason that Bentler (1980) considered it to be an approach that held the greatest promise for furthering behavioral science.

Structural equation models are analyzed most frequently by statistical packages like Linear Structural Relationships (LISREL) (Jöreskog, 1973, 1977). Such programs enable the analysis of causal models with multiple indicators of latent variables, nonrecursive causation, measurement errors, and correlated residuals. LISREL's estimation of the model consists of two parts: (a) the relations of observed measures to latent variables, or "constructs" (measurement model), and (b) the relations among the constructs (structural model).

The specification of latent variables in terms of their indicators (observed variables) is done in the *measurement model* by confirmatory factor analysis. Each hypothetical construct is extracted as a common factor that underlies the set of theoretically related, a priori specified, observed variables. Each observed variable, in turn, also has a residual—its unique variance and error term. Unlike the commonly used (exploratory) factor analysis, the factor solution in confirmatory factor analysis is unique. Furthermore, a powerful test is provided of the relations of the observed variables to the constructs.

The estimation of causal relationships among the latent variables in the *structural model* is based on maximum likelihood statistical theory: model parameters are optimally estimated so that the variance-covariance matrix implied by the model is as close as possible to the observed (sample) variance-covariance matrix. The magnitude of discrepancies between the observed and predicted (by the model) variances/covariances is estimated via a "goodness of fit" test (chi-square), with degrees of freedom equal to the difference between the number of known relationships and unknown parameters.<sup>1</sup> The goodness of fit of the whole model also can be judged by two other measures—the goodness-of-fit index (GFI), a measure of the relative amount of variances and covariances jointly accounted for by the model, and the root mean square residual (RMR), a measure of the average residual variances and covariances.

In addition, LISREL provides other information that may be useful in analyzing the model: (a) parameter estimates, which provide an indication of the importance of each parameter to the model as a whole; (b) matrices of residuals, i.e., differences between observed and implied variances/covariances; and (c) first-order derivatives and modification indices for the fixed parameters, which may suggest changes in specification of the model that would improve the model's fit to data. LISREL, therefore, has been evaluated as the best available systematic development of statistical procedures to handle the dual inferential problems of simultaneously assessing measurement and theoretical models (Miller, Rollins and Thomas, 1982).

To apply structural equations analysis (with latent variables) using LISREL for theory testing, the researcher is called upon to translate the theoretical model into an empirically testable model, i.e., specify the indicators predicted to define each latent variable (construct) and specify the predicted causal paths among these variables.

#### THE DOUBLE ABCX MODEL AS AN EMPIRICALLY TESTABLE MODEL

The empirical testing of the Double ABCX model in this study is based on an examination of Army families' adaptation to the transitional crisis of relocation in a foreign country.

Relocation is probably an aspect of military life most clearly reflecting the plight of families, particularly those of enlisted personnel (McCubbin et al., 1976; McCubbin and Marsden, 1978). Besides the associated financial hardships, the military family pays social-psychological costs. Being isolated from the traditional supports of extended family, close friends, and stable community relationships, members of military families often experience emotional and interpersonal difficulties. For military children problems in school, with friends, and at home have been noted and correlated with separation and relocation. For military members' spouses, educational and career ambitions are normally curtailed.

With overseas assignments these difficulties may become even more problematic. Not only are the financial costs greater, but families are challenged to accommodate to a foreign culture, learn a language and social customs, manage different currency, get accustomed to a new transportation system and traffic laws, and so on. In addition, there are some unique associated hardships such as getting a passport and immunizations, selling a home or a car, leaving close relatives behind, getting housing upon arrival, buying new household goods, etc.

Since all the families in our sample had experienced the same stressor event (relocation to a foreign country), we attempted to study families' adaptation to the strains and hardships associated with it (i.e., leaving the home in the U.S. and settling down overseas), as well as the effect of recent family life changes (pile-up of demands). At the same time, we attempted to study the mediating effect of family system resources, social support, and the family's sense of coherence regarding the overall circumstances.

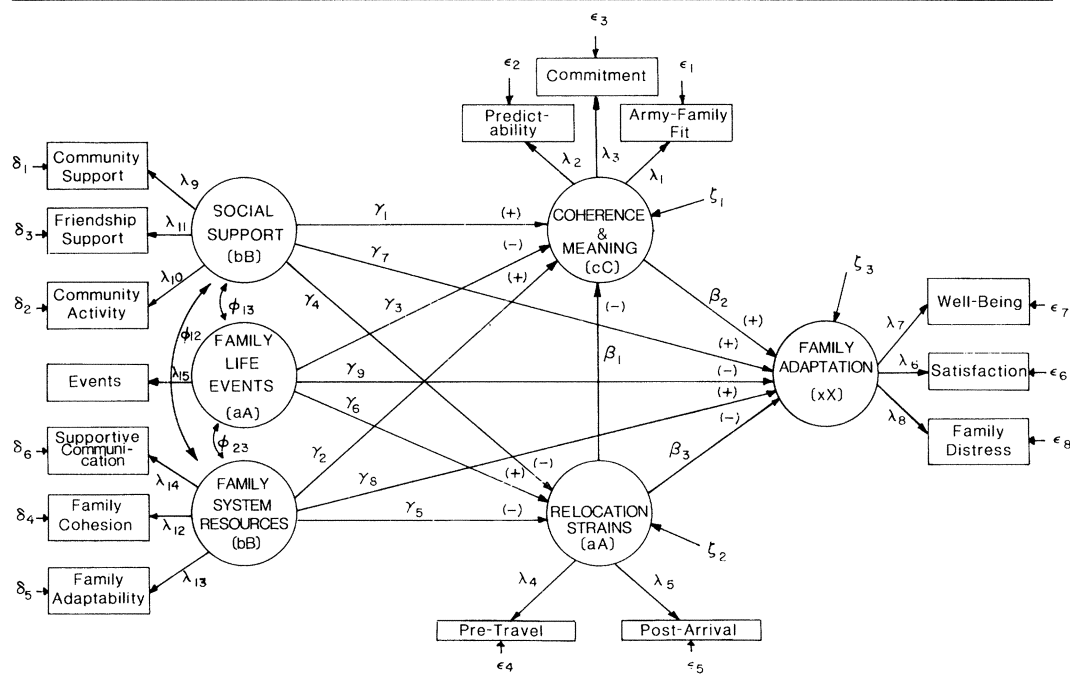
The general empirical model for this study is outlined in Figure 2. The circles in Figure 2 represent the latent variables, or constructs, and the rectangles represent the measured variables. The arrows demonstrate the proposed causal relationships among the latent variables, and the signs denote the hypothesized direction of effects (i.e., positive or negative effect).

The model contains two pile-up (aA) variables: *relocation* strains, which are hardships specifically related to the stressor event (relocation) under study, and *family life events*, which represent residual strains due to significant events in the family's life during the year prior to relocation. There are two resource (bB) variables—*family system resources* and *social support*—and a perception (cC) variable—*coherence*. Finally, *adaptation* is the model's outcome measure (xX).

In general, variables in a causal model can be either exogenous (i.e., independent, external to the model) or endogenous ("caused" by other variables in the model). In our model the two resources (family resources and social support) are assumed to be exogenous, i.e., they are not to be explained or "caused" by the model. Family life events also are represented as an exogenous variable, since these changes are perceived as "natural" causes which are not likely to be explained by other variables in the model. Coherence, relocation strain, and adaptation are endogenous variables, in that they are each being influenced by other variables in the model.

We operationally defined "family adaptation" as a composite of family members' (i.e., military member and spouse) sense of well-being; satisfaction with the family lifestyle in the Army; and low incidence of health, emotional, marital, and legal problems in the family. The model allows us to test the hypothesis that the level of adaptation is positively influenced by family system resources, social support, and coherence and negatively influenced by the stress experiences (relocation strains and family life events). In addition, it is proposed that the two "resource" variables (family system resources and social support) influence adaptation indirectly by affecting other variables

FIGURE 2. EMPIRICAL CAUSAL MODEL FOR TESTING THE DOUBLE ABCX MODEL



(relocation strain, coherence). This permits the testing of additional hypotheses which will be discussed later in this section.

The severity of strain associated with relocation is hypothesized to be (a) positively influenced by previous family life events, and (b) negatively influenced by both family system resources and social support. The hypothesized effect of family life events on relocation strain is guided by the pile-up hypothesis, namely, that the effect of two or more sources of strain is cumulative and that the severity of strain associated with a crisis situation is directly influenced by other sources of strain. At the same time, we hypothesize that the severity of relocation strain would be buffered (i.e., reduced) by family system resources and social support.

"Coherence" is operationally defined as a composite of family members' commitment to the Army mission, their sense of predictability, and their perception of "fit" between the family and the Army lifestyle. These three variables appear to capture the concept of coherence as a general framework wherein the overall situation is perceived and judged. It is hypothesized that this sense of coherence is positively influenced by the two "resource" variables—social support and family resources—and negatively influenced by

the two "stressor" variables—family life events and relocation strain.

The variable "family system resources" is operationally defined as a composite of family cohesion, family adaptability, and family supportive communication. Family cohesion and adaptability are two variables proposed to influence family vulnerability to stress and its regenerative power (Burr, 1973) which have been studied most frequently by family stress researchers (McCubbin et al., 1980). Family supportive communication is considered to be a major facilitating factor of family cohesion and adaptability (Caplan, 1976; Olson and McCubbin, 1982; Olson et al., 1983). It is hypothesized that "family system resources" influence adaptation directly, and also indirectly through their effect on coherence and on relocation strain. The direct effect on adaptation is suggested by Hansen's (1965) and Burr's (1973) propositions regarding family regenerative power; the indirect effect, through reducing the severity of relocation strain, is suggested by Hansen's and Burr's propositions regarding family vulnerability to stress. Though Hansen's (1965) and Burr's (1973) propositions apply to families facing a stressor event (precrisis), they can be applied to a postcrisis situation as well. Thus, the model permits us to

test the hypothesis that family resources influence the ease of family adaptation to postcrisis pile-up of demands. Furthermore, it allows examination of the specific function of these resources either as being part of the family's adaptive power (affecting adaptation directly) or as buffers (affecting the severity of strain).

"Social support" is defined operationally as a composite of the family's perception of the community as supportive and safe, as a network of important friends, and as a locus for activity and involvement in community life. Based on the model, it is hypothesized that *social support*, like family system resources, *has both a direct effect on the family's adaptation to the pile-up of demands and an additional indirect effect by buffering the relocation strain and by positively influencing the sense of coherence*.

To conclude, the empirical model enables us to test simultaneous relationships among the major variables of the Double ABCX model using multiple indicators of theoretical constructs. It allows us to (a) test empirically the notion of pile-up of demands and (b) examine the relative magnitude of effects of family resources, social support, and coherence on family adaptation to stress. In addition, it enables us to gain some insight into the role of family resources as influencing the family's vulnerability to stress and its adaptive power.

## SAMPLE AND DATA COLLECTION

### *Sample*

The sample for this study was drawn from the total population of U.S. Army families who were located in West Germany in May 1983. The initial sample of 1,227 officer and enlisted families selected for the Army Family Survey was drawn by a proportionate stratified method with two related and overlapping layers of stratification. Type of military unit (combat, combat support, and combat service support) was one layer used to get a representative slice of U.S. Army families. The second layer, size of military community (which also related to urban vs. rural German communities), assisted us in obtaining representation of living experiences in a foreign country (McCubbin et al., 1983).

The sample consisted entirely of intact marriages and families. Families in all stages of the family life cycle, from newlywed to empty nest, were surveyed. Both military members and their spouses completed questionnaires which were designed to tap a broad range of experiences and attitudes related to the relocation and adaptation to the Army-family lifestyle in a foreign country. Participation was voluntary, and complete

anonymity was assured. Questionnaires were self-administered, completed by military members and their spouses at home and returned within 24 hours.

The overall return rate was 86%, and almost all (98%) of the returned questionnaires were usable. A total of 53 surveys were excluded when *family* data was incomplete (one spouse's questionnaire was missing), critical data (rank) was missing, or when the military member was a female. Nine such families with female military members were excluded to achieve homogeneity of the sample.

The data analysis in the present study is based on 288 families (husbands and wives) of *enlisted personnel* (ranks Private E2 to Sergeant Major E9) who completed *all* items and scales used for the analysis. The mean age of military members and spouses was 30.9 and 29.6, respectively (range from below 20 to 50 years). The "typical" enlisted military member was a high school graduate or had some college or vocational-technical education and had been in the Army for more than 6 years. The "typical" spouse of an enlisted soldier was a high school graduate or at least had attended high school. Nearly one-third of the families belonged to a minority group. The majority (80%) of the families were in their first marriage, and close to 50% had been married between 4 to 10 years. Three-fourths (75%) of the families had either preschool children or children in school, and nearly one-fourth (23%) had adolescents or were in the launching stage of the family life cycle. Only 2% of the sample consisted of couples with no children. About one-half of those surveyed were on their first European tour. At the time the survey was conducted, nearly one-half of the families had been in Europe for one to two years.

This sample of enlisted soldiers and their spouses approximated the profile of married personnel in the U.S. Army and was representative of accompanied enlisted military personnel in the U.S. Army in Europe (McCubbin et al., 1983).

### *Measures*

Fifteen measures were used to study the relationships among the model's six latent variables:

1. *Relocation strain* was measured by two scales designed to assess the severity of strains created by leaving the U.S. and those created by arrival and settling down in Germany. (a) *Pre-travel strain* included 15 items (rated on a 4-point severity scale) related to leaving kids, relatives, and close friends behind; interruption of an educational program or medical care; giving up a job; selling a home or an automobile before relocation; and getting a passport, immunizations,



etc. (b) *Postarrival hardships* included 12 items (rated on a 4-point severity scale) related to demands in a foreign country such as getting a driver's license, learning the language, using transportation; as well as strains created by delay in getting housing, major purchases, cost of moving, and temporary duty assignments upon arrival.

2. *Family life events* was defined by a single indicator, a 12-item scale (McCubbin et al., 1981) designed to assess the occurrence and perceived severity (on a 3-point scale) of major events in the family in the year prior to relocation (e.g., marriage; birth of a child; major financial changes; health problems; death of a family member, close relative, or friend, etc.).

3. *Family system resources* was composed of three scales. (a) *Family cohesion* is a 16-item scale (Olson et al., 1982) that measured the emotional bonding that family members have toward one another around dimensions of time, space, friends, interests and recreation. (b) *Family adaptability* is a 14-item scale (Olson et al., 1982) that measured the ability of the family system to change its power structure, role relationships, and relationship rules in response to situational and developmental needs. (c) *Supportive communication* was measured by two items that tap respondent's perception of being listened to, understood, and supported by other family members.

4. *Social support* was defined by three scales (McCubbin et al., 1982). (a) *Community support* was a 6-item scale that measured the extent to which the family feels it can depend upon the community, feels secure and safe, and can depend upon help and support for their children. (b) *Friendship support* was a 5-item scale that measured the extent to which the family feels it has a network of important friends who value and care for them. (c) *Community activity* was a 3-item scale that measured the extent to which the family is active and involved and feels part of the community.

5. *Coherence and meaning* was composed of three scales (McCubbin and Patterson, 1983c). (a) *Family-army fit* was a 5-item scale that measured the degree to which the respondent feels the family is part of Army life, that the Army takes care of its families, and that help will be given if needed. (b) *Predictability* was a 3-item scale that measured the degree to which the respondent feels the family can predict the immediate future in terms of work and family schedule. (c) *Commitment* was a 4-item scale that measured the degree to which the family is committed to the Army lifestyle and to the feeling that the Army can be good for family life.

6. *Adaptation* was operationalized by three measures. (a) *General well-being* measured the degree (using an 11-point semantic differential scale) to which the respondent feels energized, peppy, vital, cheerful, healthy, relaxed, calm, and happy. (b) *Satisfaction* measured the degree (on a 4-point scale) to which the respondent is satisfied with family life and with Army life in Germany (two items). (c) *Family distress* was a checklist of emotional, marital, health, financial, and legal problems the family may have struggled with during the past three months. Family distress score reflects the number of symptoms checked.

Data for pretravel strains and family distress were collected from military members (husbands) only. Data for postarrival hardships, family life events, and family cohesion and adaptability were collected from wives only. Data for all other measures were collected from both family members, and mean family scores were used in subsequent phases of the data analysis.

## ANALYSES AND RESULTS

The correlation matrix of the observed variables (Table 1) was analyzed using LISREL VI program (Jöreskog and Sörbom, 1984).<sup>2</sup> Three consecutive analyses were conducted by changing the model's specifications, using the model presented in Figure 2 as the basic empirical model.

In order to examine the effect of pile-up of stressors and strains, the model in Figure 2 was first analyzed with paths  $\gamma_3$ ,  $\gamma_6$  and  $\gamma_9$  fixed to 0, i.e. without the effect of life events on relocation, coherence, and adaptation. The chi-square measure of goodness of fit of the model was 187.8 with 79 degrees of freedom ( $p < .01$ ). While this relatively high chi-square (compared with the number of degrees of freedom) may suggest bad fit of the model to data, it could not be a valid test statistic for the whole model since a standardized covariance matrix was analyzed and not all the observed variables were assured of having a multivariate normal distribution (see footnote 1). Other measures of the model's goodness of fit, such as goodness-of-fit index (GFI) and root mean square residual (RMR) can be judged only relatively. The GFI, which is independent of the sample size and relatively robust against departure from normality, was .914 (normal range: 0 to 1.0). The RMR was .068, compared with a root mean square correlation of .273 between the observed variables (off-diagonal), indicating a relatively small residual. Taken together with other indicators (such as absence of the clear indicators of bad fit, magnitude of normalized residuals, and plotting of the normalized residuals

TABLE 1. CORRELATION MATRIX OF INDICATOR VARIABLES

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Army-family fit	—														
2. Predictability	.548	—													
3. Commitment	.436	.367	—												
4. Pretravel	-.242	-.291	-.146	—											
5. Postarrival	-.332	-.315	-.306	.306	—										
6. Satisfaction	.590	.581	.332	-.299	-.376	—									
7. General well-being	.388	.387	.146	-.204	-.328	.464	—								
8. Family distress	-.222	-.229	-.084	.187	.170	-.293	-.361	—							
9. Community support	.591	.419	.362	-.226	-.300	.509	.325	-.138	—						
10. Community activity	.395	.222	.207	-.113	-.138	.350	.216	-.094	.447	—					
11. Friendship support	.259	.204	.106	-.064	-.050	.209	.245	-.065	.427	.316	—				
12. Cohesion	.098	.006	-.012	.026	-.091	.102	.176	-.241	.108	.024	.098	—			
13. Adaptability	.027	-.047	-.016	.096	-.008	.046	.176	-.133	.076	.014	.136	.693	—		
14. Communication	.032	.063	-.026	.055	-.095	.120	.308	-.259	.027	.009	.149	.592	.524	—	
15. Family life events	-.271	-.269	-.104	.176	.345	-.230	-.268	.245	-.154	-.158	-.101	-.090	.032	-.185	—
Mean	15.43	6.04	4.29	12.31	8.92	2.74	49.97	1.70	23.02	7.86	20.56	63.40	38.93	11.63	2.65
SD	5.59	3.64	2.46	7.65	5.92	1.40	13.03	1.30	8.24	2.75	4.34	10.20	7.61	2.88	2.74

against normal quantiles), these results may be interpreted as representing a *moderate* model's fit.

As noted earlier, the chi-square measure of goodness of fit could be used most validly in a comparative way, i.e., in comparing the model with an alternative model and measuring the change in the magnitude of chi-square relative to the change in the number of degrees of freedom (see footnote 1). Thus, the significance of this change (improvement in the model's fit) can be tested. As Jöreskog and Sörbom (1984) and others (e.g., Bentler, 1980) suggest, the model can be improved by freeing fixed parameters as assessed by the first-order derivatives or the modification indices of the program. While this procedure may indeed improve the model's fit, these modifications may not be theoretically justified. Instead, we chose to test the alternative model by freeing the  $\gamma_3$ ,  $\gamma_6$  and  $\gamma_9$  parameters, i.e. allowing family life events to "cause" relocation strain, coherence, and adaptation as proposed in the basic empirical model (Figure 2).

Analysis of this second model resulted in a chi-square of 156.6 with 76 degrees of freedom. The change in chi-square compared with the first model is 31.2 with 3 degrees of freedom, indicating a significant ( $p \leq .001$ ) improvement in the model's fit. In addition, the goodness-of-fit index has increased (GFI = .929), and the mean square residual has decreased (RMR = .059) to indicate further the improvement of the model.

While the model's fit has improved indeed, examination of other LISREL estimates indicated that it did not account for all of the observed data. First, modification indices suggested that some observed variables could have loaded on more than one latent variable. For example, the model's fit would have improved had we allowed satisfaction with Army-family lifestyle to load not only on adaptation but also on coherence. Second, few normalized residuals were significant (larger than 2 in magnitude), indicating that the corresponding data points were not sufficiently accounted for by the model's specifications. Third, it was indicated by the data (first-order derivatives and correlation of estimates) that the model's fit to data could have been improved if we had allowed residuals of some of the exogenous measures to correlate. Carefully examining each of these indices, we chose *not* to make modifications in the specifications of the model (i.e., allowing measures to load on more than one factor or allowing residuals to correlate) because we had no theoretical basis for such modifications. As Bentler (1980) and Jöreskog and Sörbom (1984) noted, adding paths, such as those representing correlations between errors, works

TABLE 2. LISREL ESTIMATES FOR MEASUREMENT MODEL (RELATIONS OF INDICATOR VARIABLES TO LATENT VARIABLES)

Construct	Indicator	Path	Unstandardized Coefficient	Standardized Coefficient	Residual	Variance
Coherence	Army-family fit	$\lambda_1$	(1.000)	.810	$\epsilon_1$	.344*
	Predictability	$\lambda_2$	.869*	.704	$\epsilon_2$	.505*
	Commitment	$\lambda_3$	.609*	.493	$\epsilon_3$	.757*
Relocation	Pretravel	$\lambda_4$	(1.000)	.474	$\epsilon_4$	.775*
	Postarrival	$\lambda_5$	1.361*	.645	$\epsilon_5$	.584*
Adaptation	Satisfaction	$\lambda_6$	(1.000)	.786	$\epsilon_6$	.382*
	Well-being	$\lambda_7$	.780*	.613	$\epsilon_7$	.624*
	Distress	$\lambda_8$	-.506*	-.398	$\epsilon_8$	.842*
Social support	Community support	$\lambda_9$	(1.000)	.883	$\delta_1$	.220*
	Community activity	$\lambda_{10}$	.594*	.524	$\delta_2$	.725*
	Friendship support	$\lambda_{11}$	.539*	.476	$\delta_3$	.774*
Family resources	Cohesion	$\lambda_{12}$	(1.000)	.883	$\delta_4$	.221*
	Adaptability	$\lambda_{13}$	.882*	.779	$\delta_5$	.393*
	Communication	$\lambda_{14}$	.768*	.667	$\delta_6$	.541*
Life events	Life events	$\lambda_{15}$	(1.000)	1.00	—	—

Note: Parenthesized coefficients are fixed reference indicators.

\* $p < .01$ .

well in practice by improving fit to data; but it is recommended only when it makes sense from a substantive point of view, or else tests can capitalize on chance associations in the data.

The rest of this section focuses, therefore, on the parameter estimates of this second model.

We turn first to the measurement model (confirmatory factor analysis). Table 2 presents results of LISREL estimates of the relations of the

observed variables to the latent variables, and the residuals for the observed variables. The loadings of observed variables on latent variables are represented by the lambda ( $\lambda$ ) coefficients. For each latent variable, one (arbitrarily selected) observed variable is fixed to 1.0 in order to give the latent variable a referent, and the others are freely estimated.<sup>3</sup> The residuals of the observed measures are represented by epsilon ( $\epsilon$ ) for the in-

TABLE 3. LISREL ESTIMATES FOR STRUCTURAL MODEL (RELATIONS AMONG LATENT VARIABLES)

Variance-covariance of Exogenous Latent Variables (Phi Matrix) <sup>a</sup>		Social Support		Family Resources		Life Events	
Social support	( $\phi_1$ )	.780 (1.000)					
Family resources	( $\phi_2$ )	.097 (.124)		.779 (1.000)			
Life events	( $\phi_3$ )	-.166 (-.189)		-.079 (-.089)		1.000 (1.000)	
Path Coefficients Between Latent Variables		Path	Unstandardized Coefficient	Standardized Coefficient	Residual	Variance	
Social support	→ Coherence	$\gamma_1$	.546**	.595	$\zeta_1$ (Coherence)	.190**	
Family resources	→ Coherence	$\gamma_2$	-.038	-.041	$\zeta_2$ (Relocation)	.133**	
Life events	→ Coherence	$\gamma_3$	-.048	-.059	$\zeta_3$ (Adaptation)	.060	
Social support	→ Relocation	$\gamma_4$	-.228**	-.424			
Family resources	→ Relocation	$\gamma_5$	.018	.034			
Life events	→ Relocation	$\gamma_6$	.195**	.411			
Social support	→ Adaptation	$\gamma_7$	-.065	-.073			
Family resources	→ Adaptation	$\gamma_8$	.202**	.227			
Life events	→ Adaptation	$\gamma_9$	.047	.060			
Relocation	→ Coherence	$\beta_1$	-.593*	-.347			
Coherence	→ Adaptation	$\beta_2$	.720**	.742			
Relocation	→ Adaptation	$\beta_3$	-.537*	-.324			

<sup>a</sup>Standardized estimates are shown in parentheses.

\* $p < .05$ , \*\* $p < .01$ .

dicators of the endogenous (dependent) latent variables and by delta ( $\delta$ ) for the indicators of the exogenous (independent) latent variables.

As can be seen in Table 2, the constructs seem reasonably well defined: all the loadings of the observed measures (not fixed as reference indicators) on latent variables were significant. Also, all the residuals were significant, suggesting that differences exist between the measures and the constructs underlying them.

Turning now to the structural model, Table 3 shows (a) variances of and covariances among latent exogenous variables ( $\phi$ ,  $\phi$ ); (b) path coefficients between latent exogenous and latent endogenous variables ( $\gamma$ ,  $\gamma$ ), path coefficients among latent endogenous variables ( $\beta$ ,  $\beta$ ), and residuals of the latent endogenous variables ( $\zeta$ ,  $\zeta$ ).

As the results in Table 3 indicate, adaptation—the model's outcome variable—appears to be directly and positively influenced by both family system resources ( $\gamma_8 = .202$ ,  $t = 3.76$ ) and coherence ( $\beta_2 = .720$ ,  $t = 3.91$ ) and directly and negatively affected by relocation strain ( $\beta_3 = -.537$ ,  $t = -2.01$ ). The coefficients of the direct effects of social support and life events on adaptation are not significant. Over 90% of the variance

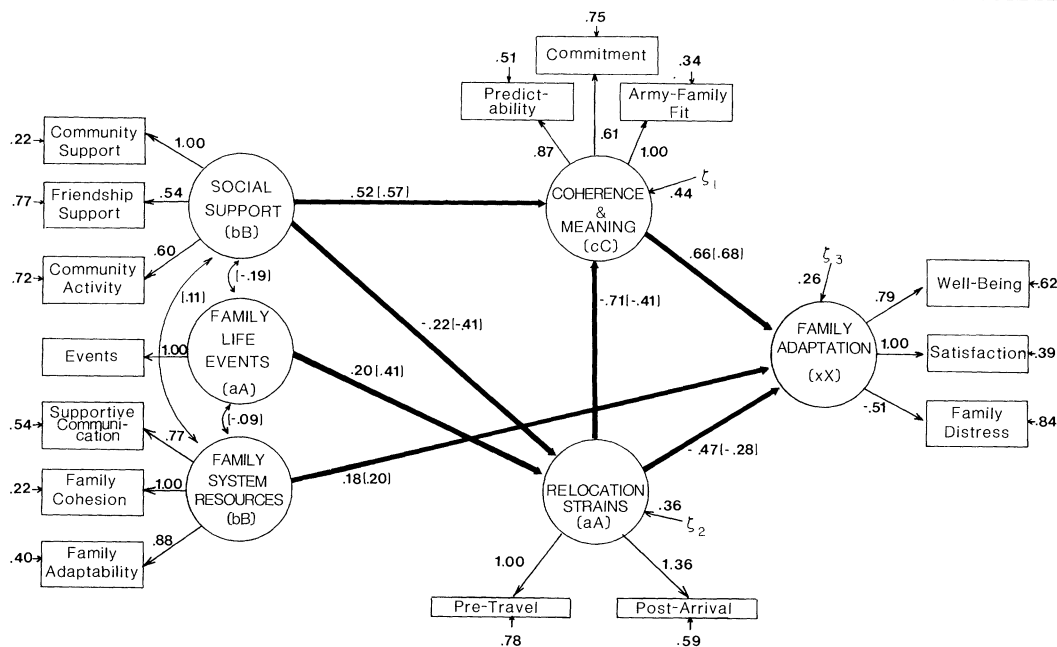
of adaptation is explained by the other five latent variables of the model, with a nonsignificant residual variance ( $\zeta_3 = .60$ ,  $t = 1.18$ ). Coherence appears to be positively affected by social support ( $\gamma_1 = .546$ ,  $t = 5.70$ ) and negatively affected by relocation strain ( $\beta_1 = -.593$ ,  $t = -2.50$ ) but not by family resources and life events. Relocation strain is positively affected by previous life events ( $\gamma_6 = .195$ ,  $t = 4.41$ ) and negatively influenced by social support ( $\gamma_4 = -.228$ ,  $t = -3.97$ ). The effect of family system resources on relocation strain is not significant.

As a final analysis, we deleted the nonsignificant paths to test the hypothesis that these paths did not contribute to the fit of the model. This revised model is presented in Figure 3. Figure 3 also shows the modified paths' unstandardized and standardized (in parentheses) coefficients.

The goodness-of-fit measure of the revised model is  $\chi^2 = 158.6$  with 81 degrees of freedom. This represents an increase in  $\chi^2$  by 2.0 with 5 degrees of freedom, an insignificant ( $p > .80$ ) change in the model's overall fit. The other two measures of goodness of fit (GFI and RMR) remained unchanged.

An examination of Figure 3 reveals that, of the two types of resources, only family system

FIGURE 3. REVISED CAUSAL MODEL



Note: Unstandardized coefficients shown. Parenthetical figures denote standardized path coefficients. All path coefficients are significant ( $p < .05$ ).

TABLE 4. DIRECT, INDIRECT, AND TOTAL EFFECTS OF MODEL'S LATENT VARIABLES ON ADAPTATION (UNSTANDARDIZED ESTIMATES)

Variables	Effect on Adaptation		
	Direct Effect	Indirect Effect	Total Effect
Life events	—	-.181	-.181
Relocation	-.466	-.465	-.931
Coherence	.656	—	.656
Family resources	.181	—	.181
Social support	—	.548	.548

resources have a direct effect on adaptation. However, while social support has no such direct effect, it does affect adaptation indirectly by positively affecting coherence and also by negatively affecting the strain of relocation. Relocation, in turn, has both a direct effect on adaptation and an indirect effect through its negative effect on coherence. Table 4 summarizes the direct, indirect, and total effects of the model's variables on adaptation.

Relocation strain appeared to have a major total effect on adaptation; and that was, as expected, a negative effect. Coherence and social support seem to affect adaptation positively and strongly: the former by its direct effect and the latter by its combined indirect effects. The total effects of life events and family system resources appear to be less than those of the other three variables, though both are significant effects.

## DISCUSSION

In that empirical testing of theoretical models is part and parcel of the process of family theory construction (Burr et al., 1979), this study contributes to the continuous work of refining family stress theory (McCubbin and Patterson, 1982, 1983a, 1983b). While numerous studies have supported hypothesized relations between pairs of variables in the Double ABCX model of family stress and adaptation (McCubbin et al., 1980), the present study examined the model as a whole.

### *The Effect of Stressors, Resources, and Coherence on Family Adaptation*

The results confirmed the hypothesis that the severity of strain associated with a transitional crisis situation is intensified by the pile-up of sources of family strain before the transitional crisis (relocation) occurs. The analysis showed that, when the effect of previous family life events were added to the model, it significantly improved the model's overall fit. Furthermore, this improvement could be almost solely explained by the effect of family life events on relocation strain,

since their effect on coherence and on adaptation was insignificant. It appears that the family struggles not only with the transitional crisis situation itself but with an accumulation of demands that stem from current as well as previous, unresolved family life changes. The results also confirmed the hypothesis that this pile-up of demands negatively influences the level of adaptation. In other words the greater the accumulation of stressors with a resulting intensification of strains, the less family members are satisfied with the family lifestyle; the less their personal well-being; and the greater the probability of health, emotional, and relational problems in the family. These findings are consistent with the family and individual research literature on life stress and illness (see Coddington, 1972; Dohrenwend and Dohrenwend, 1974; Patterson and McCubbin, 1983).

This negative effect of pile-up of demands on the family's level of adaptation does appear to be buffered by certain resources. As proposed by the model, family system resources, social support, and a sense of coherence have a positive effect on the family's level of adaptation. The results, however, show that these resources have differential effects and, therefore, possess different buffering qualities. Intrafamily system resources proved to be part of the family's *adaptive power* in that they directly enhance family adaptation. Specifically, the results suggest that families who are more cohesive, who communicate support to their members better, and whose systems are more flexible are better able to adapt to the pile-up of stressors and strains. In many respects the findings of this study are consistent with earlier studies of families under stress (Angell, 1936; Cavan and Ranck, 1938; Hill, 1949) which pointed to the powerful influences of family bonds of unity (cohesion) and flexibility in facilitating the family's recovery from crisis situations.

However, while we tend to endow positive family characteristics such as cohesion and flexibility with seemingly magical properties to reduce the strains associated with a crisis situation, our hypothesis that family system resources would also buffer the family against the severity of the strain was not supported.

Social support did not emerge as part of the family's adaptive power as was hypothesized. It appears, however, that it has a significant *indirect* role in family adaptation to stress. First, the findings of this investigation suggest that involvement in the community, community support, and friendship networks tend to ease the perceived stressfulness of the situation. In that sense social support plays an important *buffering role*. Sec-

ond, the more the community and friendship networks are supportive of the family, the more the situation as a whole is coherent and is interpreted in positive terms—there is more commitment, better perception of “fit,” and stronger feelings that things are predictable and under control. These findings support Cobb’s (1979) suggestion that, while esteem and emotional supports (such as in our notion of family resources) contribute to adaptation, network support leads to a sense of participation (i.e., fit) and control.

The findings also support the hypothesis that the family’s coherence and meaning are influenced by its experience of demands and resources. It appears, however, that the *external* environment, as the family experiences it, is more influential than the family’s internal resources. Specifically, our analysis suggests that coherence is not as affected by family system (internal) resources as it is by both negative experiences (pile-up of demands) and positive experiences of the external environment (social support). This ability to perceive the overall situation as coherent, as one that “makes sense,” and to perceive a “fit” between the family and the circumstances, in turn, is of great value to the family in facilitating its adaptation.

#### *The Application of Structural Equation Models*

This study has demonstrated the applicability of structural equation models (specifically, the LISREL model) to theory testing; the examination of several simultaneous relationships among theoretical constructs was possible. Additionally, because complex variables such as “family system resources,” “social support,” “adaptation,” or “coherence” are not likely to be captured by any one of their indicators alone, the use of multiple indicators to define these constructs was also important.

There are two additional observations worthy of note. First, examination of the results revealed that some of the measures’ residuals were non-random errors and that they tended to covary. This is not surprising given that our measures were—as in many family studies—self-reports (for instance, see Thomson and Williams, 1984). LISREL enables the investigator to detect non-random, systematic errors, and to obtain estimate of their magnitude and covariances, while the latent variables themselves are maintained free of these errors.

Second, examination of the modification indices of the confirmatory factor analysis suggested stronger ties between coherence and adaptation than were proposed by our empirical model. These clues may be investigated further in

future research and ultimately may facilitate refining the original Double ABCX model (Lavee and McCubbin, 1985).

While the present study attempts to clarify the relations among the major variables of the Double ABCX model, the task has not yet been completed. First, changes in the model’s specifications, as suggested by the results of this study, can be introduced and empirically tested. For example, once the strong causal effect of family life events on relocation has been confirmed, would the model fit better if a new latent variable, say pile-up, replaced the two separate stressor variables in our model? Second, not all of the theoretical constructs of the Double ABCX model were measured and, consequently, not all were entered into our structural model. For instance, personal resources and coping strategies were not included. Future research can estimate not only their adaptive and buffering roles but also their relations to other resources. Finally, future research should examine the relationships among stressors, resources, perception, and adaptation in other sets of pile-up of demands and in other populations.

#### FOOTNOTES

1. This “goodness of fit” test, and its associated probability level, may not be valid as a likelihood ratio test statistic of the whole model in most practical cases, especially when not all the observed variables have a multivariate normal distribution and the analysis is based on a standardized covariance matrix (Jöreskog and Sörbom, 1984). However, it is a useful index in assessing the value of the causal model: the lower the chi-square relative to the degrees of freedom, the better the model’s fit. This statistic is more useful in comparative model fitting, i.e., in comparing alternative models and assessing model’s improvement by the change in chi-square relative to the change in degrees of freedom.
2. As a general rule, the covariance matrix should be analyzed. However, if the units of measurement in the observed variables have no intrinsic meaning (as in our measures), a correlation matrix can be analyzed as long as the data are cross-sectional and the model is tested within a single population (for example, see Jöreskog and Sörbom, 1984; Kenny, 1979; Long, 1976).
3. Alternatively, the exogenous variables can be standardized by fixing the diagonal elements (variances) of the phi matrix to unity. We have chosen to define these variables’ measurement units by assigning reference indicators as in the endogenous variables.

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